

better condition for appeal. Consideration of the arguments in this Response is respectfully requested.

Claims 1, 2, 4-7, 12-16, 23, 25, and 28-33 remain in the application.

B. 35 U.S.C. § 103(a) – Claims 1-7, 12-16, and 23-28

Admitted Prior Art in view of Hembree, Domadia, and Akram

Claims 1, 2, 4-7, 12-16, 23, 25 and 28-33 stand rejected under 35 U.S.C. § 103(a) as being obvious over the admitted prior art (i.e., the background portion of the present invention – hereinafter referred to as “the APA”) in view of U.S. Patent No. 5,783,461 issued July 21, 1998 to David Hembree (hereinafter “the Hembree patent”), U.S. Patent No. 5,949,137 issued September 7, 1999 to Domadia, et al. (hereinafter “the Domadia patent”), and U.S. Patent No. 5,736,456 issued April 7, 1998 to Salman Akram (Office Action, pages 2-7).

Independent Claim 1 and Dependent Claims 2 and 4-7

Although, the Office Action states that claim 1 has been rejected as obvious over the APA in view of Hembree, Domadia, and Akram, only the APA is applied to reject independent claim 1. As stated by the Applicants in the previous Amendment mailed December 27, 2000, at a minimum the “examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985), see M.P.E.P. 706.02(j). Thus, since the only line of reasoning presented for the rejection of claim 1 is the APA, Applicants will respond to this reasoning.

The Office Action at page 2 states that the APA teaches “solder balls extending between the substrate contacts and motherboard contacts and attached to one of those contacts”.

Applicants respectfully contend that this is an inaccurate statement. In fact, the APA teaches that the solder balls are reflowed, stating:

The solder balls 234 are reflowed (i.e., melted) which attaches the interposer substrate 204 to the carrier substrate 232.

Thus, the solder balls are attached to both the substrate contacts and the motherboard contacts, not one of the contacts.

Further, the Office Action at page 2 states that the admitted prior art teaches “a compression mechanism/support structure for imparting pressure between the substrate and the motherboard”. Applicants respectfully contend that this is an inaccurate statement. In fact, the admitted prior art teaches the opposite, as follows:

The microelectronic device 202 and the interposer substrate 204 may be supported by a support structure 242. The support structure 242 includes a frame 244, a backing plate 246, a thermal plate 248, and a plurality of retention devices (shown as bolts 252 and nuts 254). The backing plate 246 is placed adjacent a second surface 256 of the carrier substrate 232. The frame 244 is placed adjacent to the carrier substrate first surface 238 and at least partially surrounds the microelectronic package 208. The thermal plate 248 abuts the heat slug 222 and extends over the frame 244. The bolts 252 extend through the backing plate 246, the frame 244, and the thermal plate 248, and are retained by nuts 254 threaded thereon. *The frame 244 not only acts to support the assembly, but also acts as a stop to prevent overtightening of the retention devices,* which could damage the microelectronic device. The thermal plate 248 is generally thermally conductive to assist the heat slug 222 in removing heat generated by the operation of microelectronic device 202. (emphasis added)

Rather than imparting pressure between the substrate and the motherboard, the frame of the support structure prevents the tightening thermal plate toward the motherboard, which would

impart pressure between the substrate and the motherboard. Further, since the solder balls are reflowed to attach the motherboard to the substrate with the APA, there is no need to impart pressure between the substrate and the motherboard.

It is clear that the APA does not teach or suggest the invention as claimed in independent claim 1. Thus, independent claim 1 is allowable over the APA. Furthermore, since independent claim 1 is allowable over the admitted prior art, all of its dependent claims (i.e., claims 2 and 4-7) are also allowable on the same basis. Thus, the arguments made in the Office Action at page 3 and 4 with regard to the dependent claims 2 and 4-7 are moot.

Independent Claim 12 and Dependent Claims 14-16

The Office Action at page 4 states that “[t]he combined teachings of the APA and Hembree apply to Claim 12 as explained above for claim 1.” However, Hembree was not applied to reject independent claim 1. Thus, if Office Action meant to apply Hembree to reject claim 12, then the Office has failed to “present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references”, as set forth in M.P.E.P. 706.02(j). Therefore, it is assumed that the addition of Hembree in the sentence of the Office Action is a typo and that the Examiner meant that independent claim 12 is rejected for the same reason as independent claim 1.

Independent claim 12 contains similar limitations to those in independent claim 1. Thus, the reasoning set forth for overcoming the rejection of independent claim 1, set forth above, apply equally to independent claim 12. Thus, the APA also fails to teach or suggest the limitations of independent claim 12. Thus, independent claim 12 is allowable over the APA. Furthermore, since independent claim 12 is allowable over the APA, all of its dependent claims

(i.e., dependent claims 13-16) are also allowable on the same basis. Thus, the arguments made in the Office Action at page 3 and 4 with regard to the dependent claims 13-16 are moot.

Independent Claim 23 and Dependent Claim 25

The Office Action at page 5 states that “[c]laim 23 is rejected as explained above for claims 5 and 1”. Claim 23 claims a recess in a substrate wherein a substantially vertical sidewall of the recess has a conductive material layered thereon.

Claim 1 was rejected over the APA and claim 5 was rejected over a combination of the APA and the Hembree patent. However, the APA does not teach or suggest a recess at all, much less one with a conductive material layered on vertical sidewalls thereon. The Hembree also does not teach or suggest a conductive material layered recess as claimed. At best, the Hembree teaches a slightly recessed contact pad, but does not have a conductive material layered on a sidewall thereof. The only structure taught or suggested in Hembree having a conductive material on a sidewall is a projection which extends from a substrate rather than a recess in the substrate.

Thus, the APA and Hembree neither teach or suggest the claimed invention. Therefore, independent claim 23 is allowable. Furthermore, since independent claim 23 is allowable, its dependent claim 25 is also allowable on the same basis.

Independent Claim 28 and Dependent Claims 29-31

The Office Action at page 6 states that “[t]he combined teachings of the APA, Hembree, and Akram apply to Claim 28 as explained above for claims 1, 5-7 and 23, 25-27.” That is the extent of the rejection. However, independent claim 28 claims a limitation which does not exist in any other claim, so how can the Office contend that it has presented “a convincing line of

reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references”, as set forth in M.P.E.P. 706.02(j). Claim 28 claims a recess, which has a conductive layered over said recess, which creates a void (see FIG. 2e and the specification at page 11, line 9-17). As previously pointed out in the December 27, 2000 Amendment, the Applicants could find nothing in the cited patents that even remotely teaches or suggests such a design. Thus, the rejection presented in the Office Action is without merit and claim 28 and its dependent claim 29 are allowable over the cited art.

Independent Claim 32 and Dependent Claim 33

The Office Action merely states that the “combined teaching of the APA, Hembree, and Akram apply to claim 32 as explained above for claims 23, 7, 1”. Independent claim 32 expressly claims the semispherical design for the recessed contact. This is also neither taught nor suggested by the APA, the Hembree patent or the Akram patent, alone or in combination. The Office Action, with regard to claim 7, essentially states that the APA patent fails to specify the dimensions such as a width and shape of contact having a diameter of the solder ball and shape of a semispherical surface, but that such would be a matter of design choice. Again, the Applicants strongly disagree with the Office Action’s contention. The presently claimed invention deals with non-reflow electrical contact in the fabrication of a microelectronic device rather than permanent attachment discussed in the APA patent. Thus, with the present invention, efficient contact of the solder balls between the components becomes critical, and the presently claimed invention contemplates designs to achieve such contact. As the Office well knows, “there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or

combine reference teachings.” *In re Vaeck*. The Office Action has not shown any suggestion or motivation for the fabrication of such designs. Again, at a minimum, as stated in the M.P.E.P. 706.02(j), the “examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.” *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Applicants do not believe that the Office has carried its burden in this instance.

With regard to dependent claim 33, the Office Action at page 6 states the “[i]t is conventional in the chip interconnection technology art to use additional resilient material/layer under conductive material layer to improve the interconnection reliability.” This, of course, begs the question “If this is so conventional, why can’t the Office cite a reference on point?” The Office only cites the Akram patent as “using resilient materials using soft/resilient materials such as gold, etc.” The Akram patent merely teaches a method of forming a bond pad, which can include multiply conductive layers. Further, as the Office should know, the metals (such as gold) cited in the Akram patent are malleable, not resilient. Resilient materials deform under pressure and return substantially to its original shape when the pressure is released. Malleable materials do not do so, as they remain in the deformed shape when the pressure is released.

The current Section 103(a) rejections are without merit. Therefore, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 1, 2, 4-7, 12-16, 23, 25, and 28-33, and request allowance of the application.

Please forward further communications to the address of record. If the Examiner needs to contact the below-signed attorney to further the prosecution of the application, the contact number is (503) 712-1682.

Respectfully submitted,



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